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Yamada et al.

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(54) **COMPRESSOR, UPPER HALF ASSEMBLY OF THE COMPRESSOR, UPPER HALF DIAPHRAGM OF THE COMPRESSOR, AND COMPRESSOR ASSEMBLING METHOD**

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(51) **Int. Cl.**

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F04D 17/12	(2006.01)
F04D 29/62	(2006.01)
F04D 29/28	(2006.01)

(52) **U.S. Cl.**

CPC ***F04D 29/426*** (2013.01); ***F04D 17/12*** (2013.01); ***F04D 29/286*** (2013.01); ***F04D 29/42*** (2013.01); ***F04D 29/624*** (2013.01); ***F04D 29/628*** (2013.01); *F04D 17/122* (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

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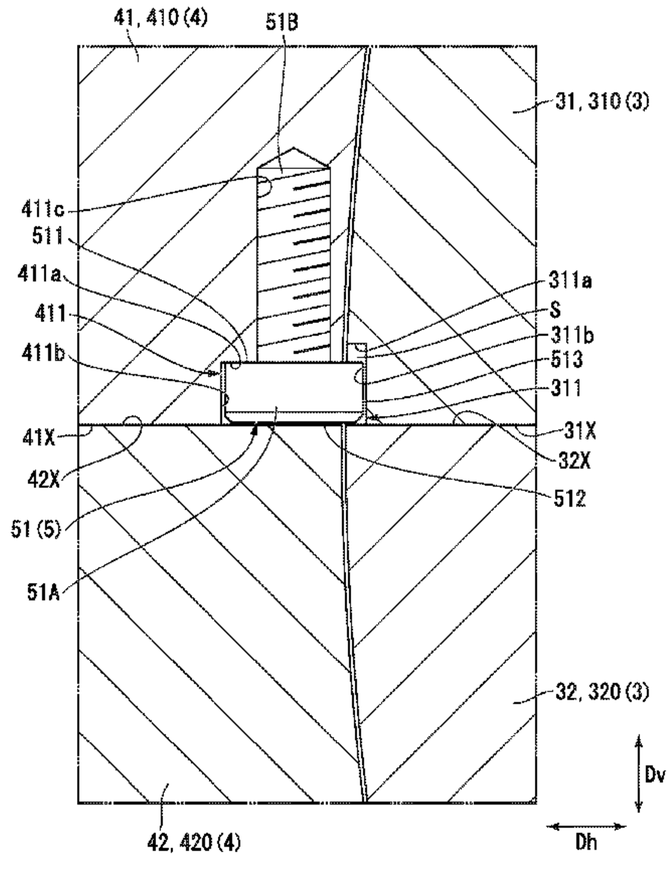
(57) **ABSTRACT**

A compressor includes: an upper half casing having upper half casing parting planes; upper half diaphragms configured to be disposed on an inner circumferential side of the upper half casing and having upper half diaphragm parting planes; and upper half position regulating parts that regulate positions of the upper half casing and the upper half diaphragms. The upper half position regulating parts are fixed to at least one of the upper half casing and one of the upper half diaphragms, and have upper half abutting members at which upper half abutting surfaces, each of which comes into contact with an upper half casing recessed surface of the upper half casing and an upper half diaphragm recessed surface of the upper half diaphragm, are formed.

3 Claims, 6 Drawing Sheets



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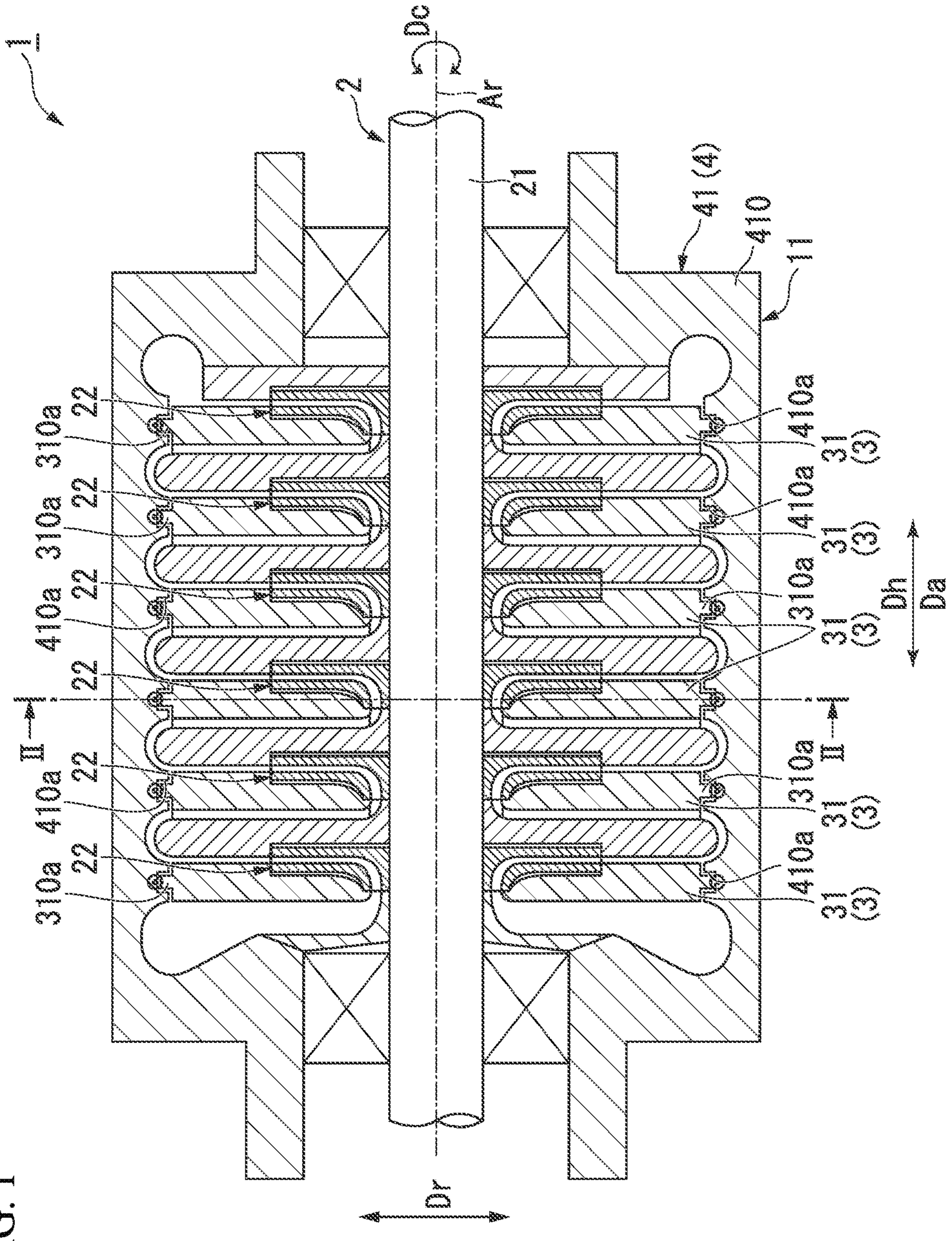


FIG. 1

FIG. 2

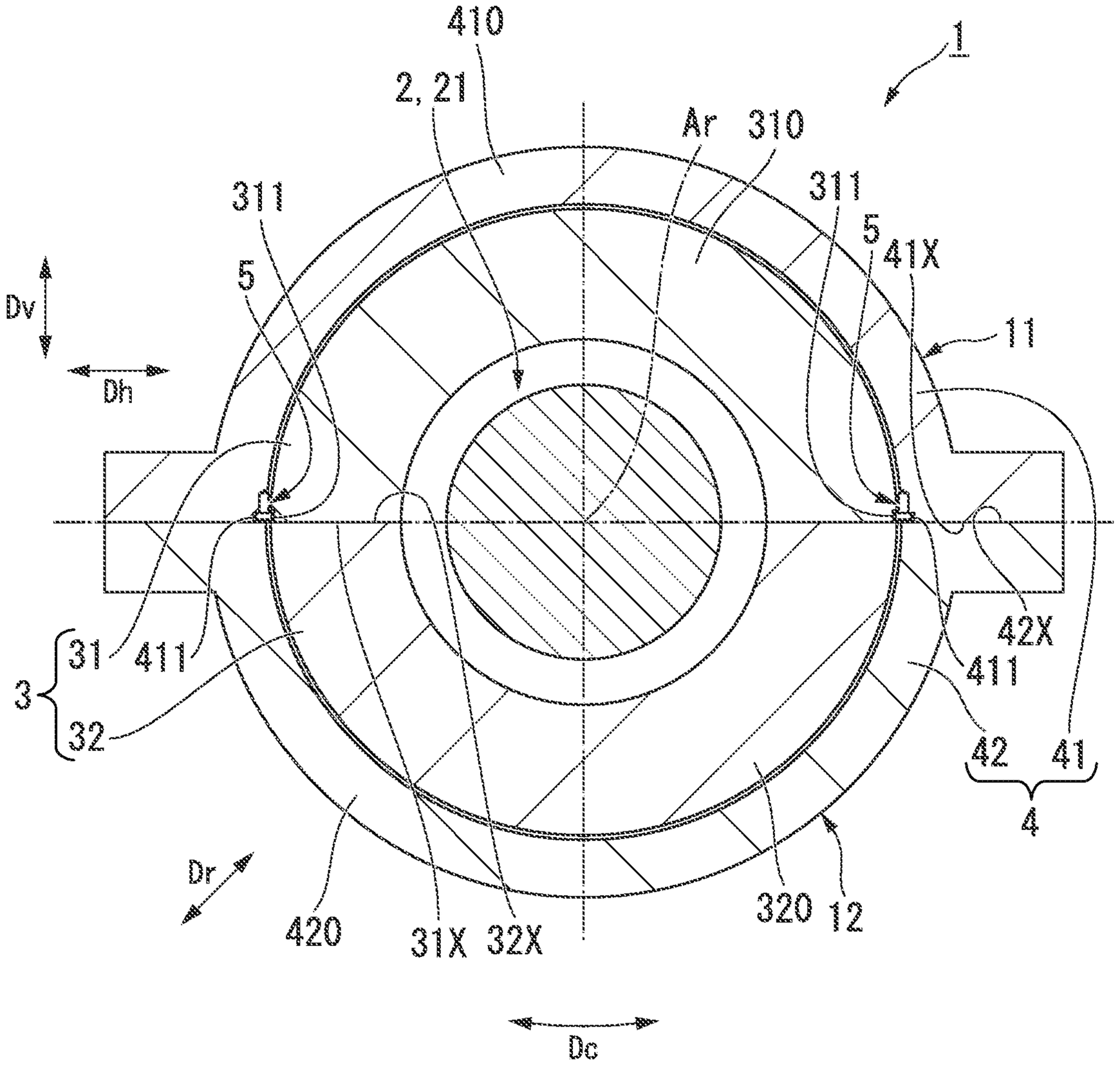

1
410
2, 21
Ar
310
311
311
5
5
41X
11
Dv
Dh
42X
411
31
411
3
32
42
41
4
Dr
420
31X
32X
320
12
Dc

FIG. 3

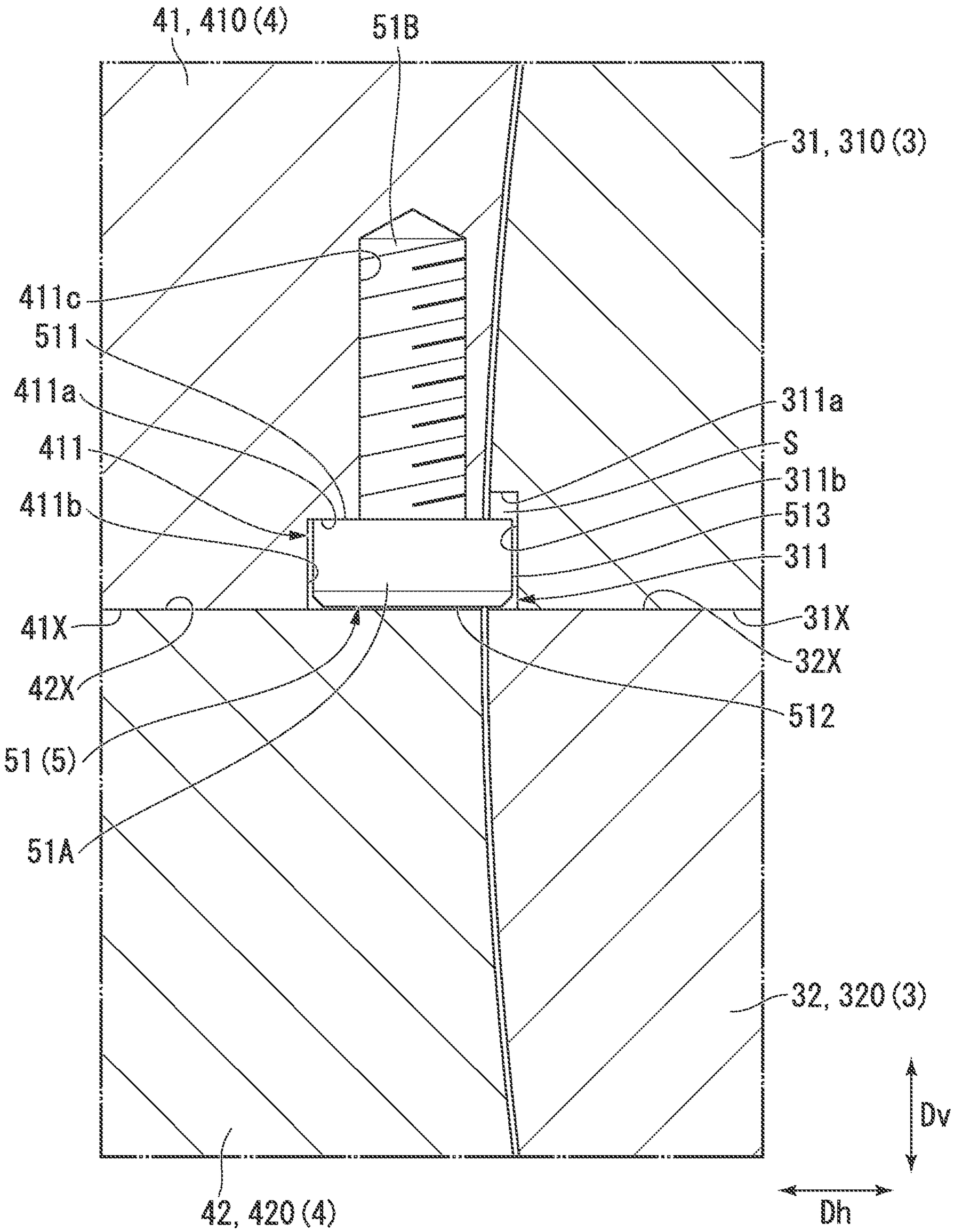

41, 410 (4)
51B
31, 310 (3)
411c
511
411a
411
411b
41X
42X
51 (5)
51A
311a
S
311b
513
311
31X
32X
512
32, 320 (3)
Dv
Dh
42, 420 (4)

FIG. 4

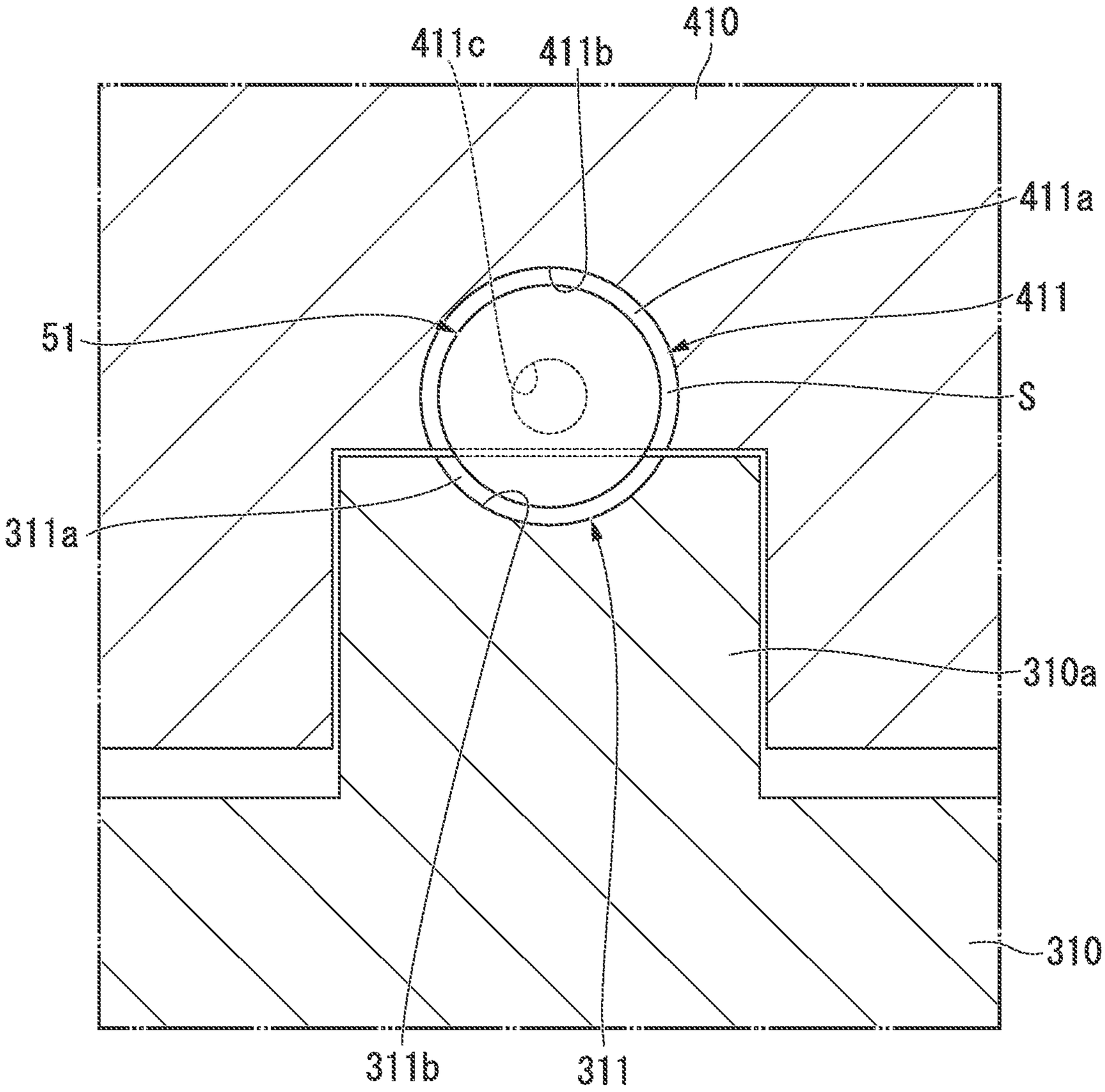


FIG. 5

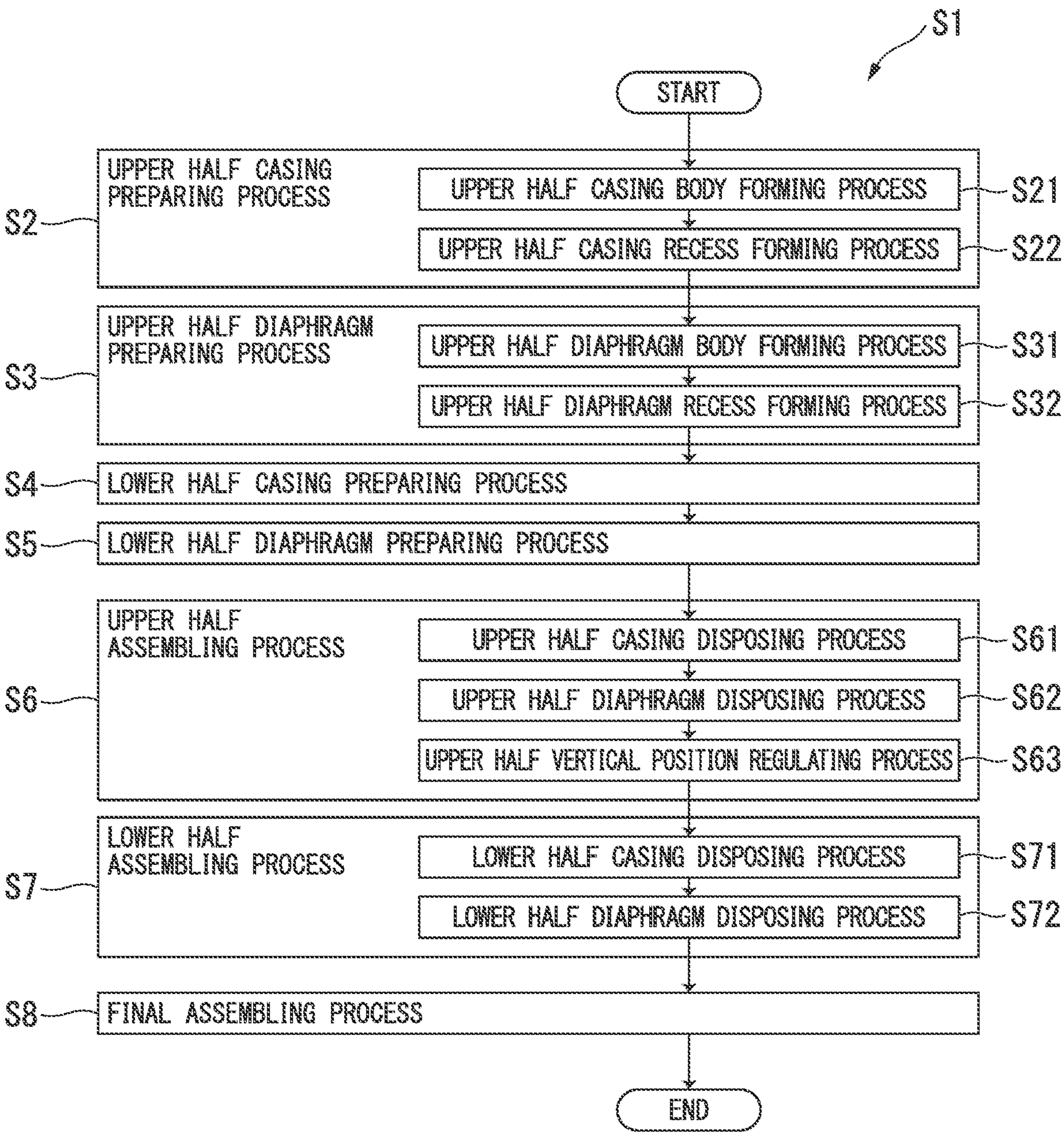
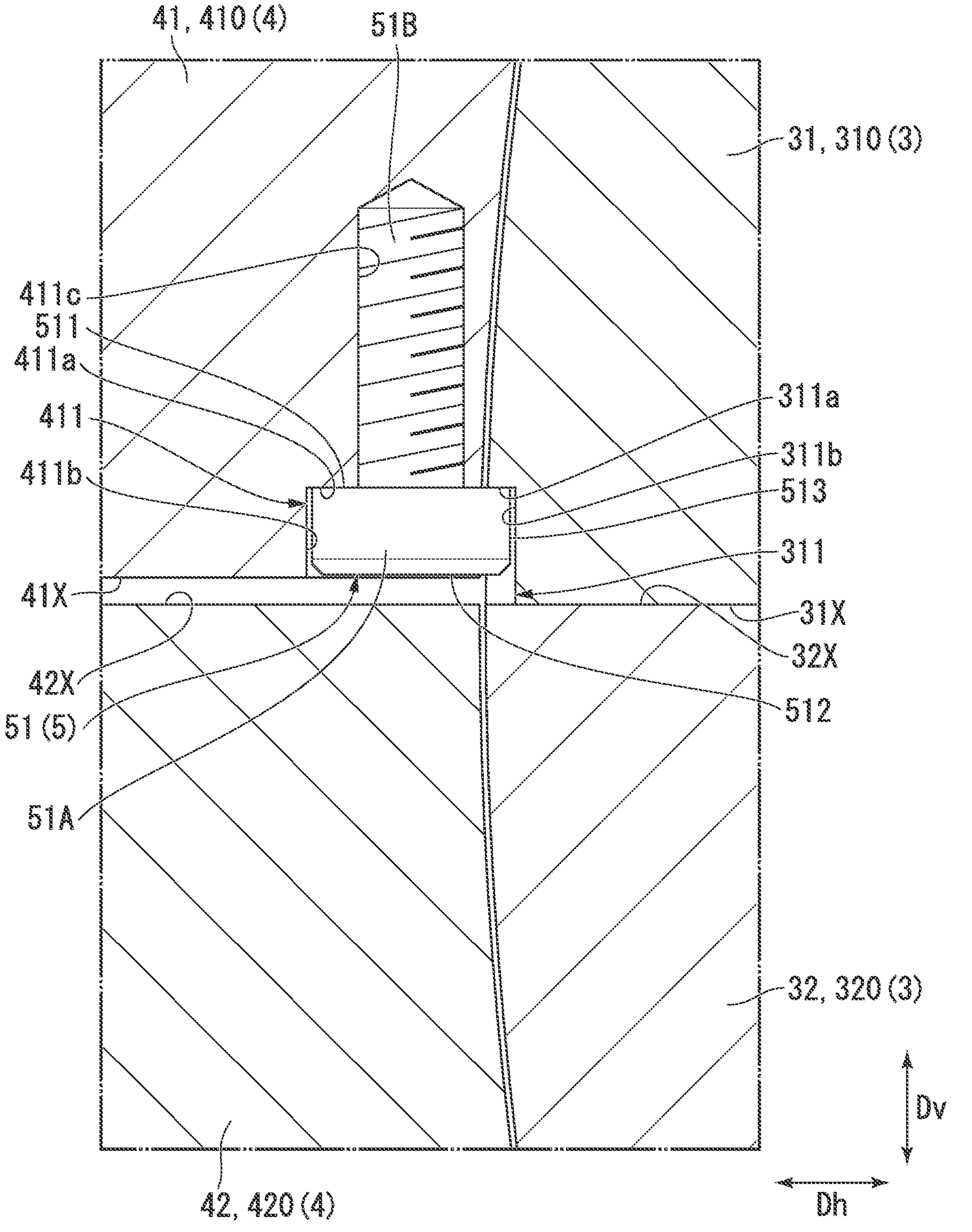

S1
START
S2
UPPER HALF CASING PREPARING PROCESS
UPPER HALF CASING BODY FORMING PROCESS
S21
UPPER HALF CASING RECESS FORMING PROCESS
S22
S3
UPPER HALF DIAPHRAGM PREPARING PROCESS
UPPER HALF DIAPHRAGM BODY FORMING PROCESS
S31
UPPER HALF DIAPHRAGM RECESS FORMING PROCESS
S32
S4
LOWER HALF CASING PREPARING PROCESS
S5
LOWER HALF DIAPHRAGM PREPARING PROCESS
S6
UPPER HALF ASSEMBLING PROCESS
UPPER HALF CASING DISPOSING PROCESS
S61
UPPER HALF DIAPHRAGM DISPOSING PROCESS
S62
UPPER HALF VERTICAL POSITION REGULATING PROCESS
S63
S7
LOWER HALF ASSEMBLING PROCESS
LOWER HALF CASING DISPOSING PROCESS
S71
LOWER HALF DIAPHRAGM DISPOSING PROCESS
S72
S8
FINAL ASSEMBLING PROCESS
END

FIG. 6


41, 410 (4)
51B
31, 310 (3)
411c
511
411a
411
411b
41X
42X
51 (5)
51A
311a
311b
513
311
31X
32X
512
32, 320 (3)
Dv
Dh
42, 420 (4)

COMPRESSOR, UPPER HALF ASSEMBLY OF THE COMPRESSOR, UPPER HALF DIAPHRAGM OF THE COMPRESSOR, AND COMPRESSOR ASSEMBLING METHOD

CROSS-REFERENCE TO RELATED APPLICATIONS

Priority is claimed on Japanese Patent Application No. 2017-170116, filed Sep. 5, 2017, the content of which is incorporated herein by reference.

BACKGROUND

Technical Field

The present disclosure relates to a compressor, an upper half assembly of the compressor, an upper half diaphragm of the compressor, and a compressor assembling method.

Description of Related Art

Centrifugal compressors force a gas to pass through rotating impellers in a radial direction, and compress the gas using a centrifugal force generated at that time. Among centrifugal compressors, a multistage type centrifugal compressor that includes the impellers in multiple stages in an axial direction and compresses the gas step by step is known.

In this centrifugal compressor, there is a structure that has diaphragms in a casing. For example, in a multistage centrifugal compressor disclosed in Patent Document 1, a plurality of diaphragms connected in an axial direction are housed in a casing. In the multistage centrifugal compressor, a rotor is disposed to pass through the diaphragms.

Meanwhile, in the casing and diaphragms, a structure that can be parted by a parting plane spread in a horizontal direction may be adopted. In this case, the casing and diaphragms are each made up of an upper half part and a lower half part. When an upper half assembly into which the upper half parts of the casing and diaphragms are put together and a lower half assembly into which the lower half parts of the casing and diaphragms are put together are assembled, there is a need to assemble the upper half assembly and the lower half assembly such that no gap occurs between the upper half assembly and the lower half assembly. Especially, in the diaphragms in which the rotor is disposed, there is a need to bring the parting plane for the upper half diaphragms and the parting plane for the lower half diaphragms into close contact with each other with no gap and to secure sealability.

[Patent Document 1] Japanese Unexamined Patent Application, First Publication No. 2014-129752

However, when the upper half assembly and the lower half assembly are assembled, in a case in which the parting planes for the casing come into contact with each other first, there is a possibility of a gap occurring between the parting planes for the upper half diaphragms and the lower half diaphragms. For this reason, it is desirable to suppress the occurrence of a gap between the parting planes for the diaphragms and to assemble the upper half assembly and the lower half assembly.

The present disclosure was made in response to this demand, and an object thereof is to provide a compressor capable of suppressing occurrence of a gap between parting planes for diaphragms when assembled, an upper half assembly of the compressor, an upper half diaphragm of the compressor, and a compressor assembling method.

SUMMARY

A compressor according to a first aspect of the present disclosure includes: an upper half casing extending in a circumferential direction of a rotor that is rotatable about an axis and having upper half casing parting planes that are horizontal planes directed downward in a vertical direction at opposite ends thereof in the circumferential direction; a lower half casing extending in the circumferential direction and having lower half casing parting planes that is capable of coming into contact with the upper half casing parting planes at opposite ends thereof in the circumferential direction; upper half diaphragms extending in the circumferential direction, capable of being disposed on an inner circumferential side of the upper half casing, and having upper half diaphragm parting planes that are horizontal planes directed downward in the vertical direction at opposite ends thereof in the circumferential direction; lower half diaphragms extending in the circumferential direction, capable of being disposed on an inner circumferential side of the lower half casing, and having lower half diaphragm parting planes that is capable of coming into contact with the upper half diaphragm parting planes at opposite ends thereof in the circumferential direction; and upper half position regulating parts configured to regulate positions of the upper half casing and the upper half diaphragms in a state in which the upper half diaphragm parting planes are movable relative to the upper half casing parting planes to protrude in the vertical direction. The upper half casing has upper half casing recesses that are recessed upward on inner circumferential sides of the upper half casing parting planes in the vertical direction such that upper half casing recessed surfaces directed in a direction including the vertical direction are formed, and each of the upper half diaphragms has upper half diaphragm recesses that are recessed upward on outer circumferential sides of the upper half diaphragm parting planes in the vertical direction such that upper half diaphragm recessed surfaces directed in the direction including the vertical direction are formed, and that form housing spaces communicating with the upper half casing recesses when disposed on the inner circumferential side of the upper half casing. The upper half position regulating parts are fixed to at least one of the upper half casing and one of the upper half diaphragms in the housing spaces, and have upper half abutting members at which upper half abutting surfaces, each of which comes into contact with the upper half casing recessed surface and the upper half diaphragm recessed surface, are formed.

With this configuration, the upper half abutting members causes the upper half diaphragm parting planes to be movable relative to the upper half casing parting planes to protrude in the vertical direction. That is, in a state in which the upper half casing and the upper half diaphragms are assembled together, the upper half diaphragms are configured to be movable relative to the upper half casing. In this state, an upper half assembly and a lower half assembly are combined, so that the upper half diaphragms are lowered due to deadweight, and the upper half diaphragm parting planes protrude downward from the upper half casing parting planes in the vertical direction. For this reason, when the upper half assembly is placed on the lower half assembly, the lower half diaphragm parting planes and the upper half diaphragm parting planes can be brought into contact with each other before the lower half casing parting planes and

the upper half casing parting planes come into contact with each other. As a result, in a state in which the upper half diaphragm parting planes and the lower half diaphragm parting planes are reliably in contact with each other, the upper half casing parting planes and the lower half casing parting planes come into contact with each other, and the upper half assembly and the lower half assembly are combined. Therefore, by merely placing the upper half assembly on the lower half assembly, the lower half diaphragm parting planes and the upper half diaphragm parting planes as well as the lower half casing parting planes and the upper half casing parting planes can come into contact with each other with high accuracy.

In a compressor according to a second aspect of the present disclosure, in the first aspect, the upper half abutting members may be fixed to the upper half casing in a state in which each of the upper half abutting surfaces is in contact with the upper half casing recessed surface and makes a gap with respect to the upper half diaphragm recessed surface.

With this constitution, the upper half casing recessed surfaces are made immovable relative to the upper half abutting surfaces, and the upper half diaphragm recessed surfaces are made movable relative to the upper half abutting surfaces. Thereby, due to the upper half abutting members, the upper half diaphragm parting planes are kept movable relative to the upper half casing parting planes to protrude in the vertical direction. That is, by merely mounting the upper half abutting members on the upper half casing, the upper half diaphragms can be made movable relative to the upper half casing in a state in which the upper half casing and the upper half diaphragms are assembled together. Therefore, adjustment work for positioning becomes easy and can be performed by merely fixing the upper half abutting members.

In a compressor according to a third aspect of the present disclosure, in the second aspect, each of the upper half abutting members may be a bolt member in which the upper half abutting surface becomes a seating face, and may be inserted into and fixed in a bolt hole formed in the upper half casing recessed surface.

With this constitution, the relative movement of the upper half diaphragm recessed surfaces relative to the upper half casing recessed surfaces can be restricted using the seating faces of the bolt members. Thereby, the relative movement of the upper half diaphragm parting planes relative to the upper half casing parting planes in the vertical direction can be restricted by a simple configuration.

In a compressor according to a fourth aspect of the present disclosure, in any one of the first to third aspects, a depth of the upper half diaphragm recess may be deeper than that of the upper half casing recess.

With this configuration, the amount of the relative movement of the upper half diaphragm parting planes relative to the upper half casing parting planes in the vertical direction can be adjusted by the depth of the upper half diaphragm recess and the depth of the upper half casing recess.

An upper half assembly of a compressor according to a fifth aspect of the present disclosure includes: an upper half casing extending in a circumferential direction of a rotor that is rotatable about an axis and having upper half casing parting planes that are horizontal planes directed downward in a vertical direction at opposite ends thereof in the circumferential direction; upper half diaphragms extending in the circumferential direction, disposed on an inner circumferential side of the upper half casing, and having upper half diaphragm parting planes that are horizontal planes directed downward in the vertical direction at opposite ends thereof in the circumferential direction; and upper half position regulating parts configured to regulate position of the upper half diaphragms relative to the upper half casing and in a state in which the upper half diaphragm parting planes are movable relative to the upper half casing parting planes to protrude in the vertical direction. The upper half casing has upper half casing recesses that are recessed upward on inner circumferential sides of the upper half casing parting planes in the vertical direction such that upper half casing recessed surfaces directed in a direction including the vertical direction are formed, and each of the upper half diaphragms has upper half diaphragm recesses that are recessed upward on outer circumferential sides of the upper half diaphragm parting planes in the vertical direction such that upper half diaphragm recessed surfaces directed in the direction including the vertical direction are formed, and that form housing spaces communicating with the upper half casing recesses when disposed on the inner circumferential side of the upper half casing. The upper half position regulating parts are fixed to at least one of the upper half casing and one of the upper half diaphragms in the housing spaces, and have upper half abutting parts at which upper half abutting surfaces, each of which comes into contact with the upper half casing recessed surface and the upper half diaphragm recessed surface, are formed.

An upper half diaphragm of a compressor according to a sixth aspect of the present disclosure is the upper half diaphragm configured to be disposed on an inner circumferential side of an upper half casing that extends in a circumferential direction of a rotor that is rotatable about an axis and has upper half casing parting planes that are horizontal planes directed downward in a vertical direction at opposite ends thereof in the circumferential direction, and is movable relative to the upper half casing to protrude in the vertical direction. The upper half diaphragm includes: an upper half diaphragm body extending in the circumferential direction and having upper half diaphragm parting planes that are horizontal planes directed downward in the vertical direction at opposite ends thereof in the circumferential direction; and upper half diaphragm recesses recessed upward on outer circumferential sides of the upper half diaphragm parting planes in the vertical direction such that upper half diaphragm recessed surfaces directed in a direction including the vertical direction are formed. The upper half diaphragm recesses are configured to form housing spaces that communicate with the upper half casing recesses of the upper half casing recessed upward on inner circumferential sides of the upper half casing parting planes when the upper half diaphragm body is disposed on the inner circumferential side of the upper half casing.

A compressor assembling method according to a seventh aspect of the present disclosure includes: an upper half casing preparing process of preparing an upper half casing extending in a circumferential direction of a rotor that is rotatable about an axis and having upper half casing parting planes that are horizontal planes directed downward in a vertical direction at opposite ends thereof in the circumferential direction; a lower half casing preparing process of preparing a lower half casing extending in the circumferential direction and having lower half casing parting planes that come into contact with the upper half casing parting planes at opposite ends thereof in the circumferential direction; an upper half diaphragm preparing process of preparing upper half diaphragms extending in the circumferential direction, capable of being disposed on an inner circumferential side of the upper half casing, and having upper half diaphragm parting planes that are horizontal planes directed

downward in the vertical direction at opposite ends thereof in the circumferential direction; a lower half diaphragm preparing process of preparing lower half diaphragms extending in the circumferential direction, capable of being disposed on an inner circumferential side of the lower half casing, and having lower half diaphragm parting planes that come into contact with the upper half diaphragm parting planes at opposite ends thereof in the circumferential direction; an upper half assembling process of mounting upper half position regulating parts, which keep the upper half casing and the upper half diaphragms movable relative to each other such that the upper half diaphragm parting planes protrude in the vertical direction with respect to the upper half casing parting planes after the upper half diaphragms are disposed on the inner circumferential side of the upper half casing, on at least one of the upper half casing and one of the upper half diaphragms and forming an upper half assembly; a lower half assembling process of disposing the lower half diaphragms on the inner circumferential side of the lower half casing and forming a lower half assembly; and a final assembling process of bringing the upper half diaphragm parting planes into contact with the lower half diaphragm parting planes and installing the upper half assembly on the lower half assembly.

According to the present disclosure, occurrence of a gap between parting planes of each diaphragm is suppressed to enable assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a sectional view showing a cross section of a centrifugal compressor of an embodiment of the present disclosure from below in a vertical direction.

FIG. **2** is a schematic sectional view of the centrifugal compressor in which a rotor is simplified in a cross section taken along line II-II of FIG. **1**.

FIG. **3** is an enlarged sectional view of key parts showing upper half vertical position regulating parts of the embodiment of the present disclosure.

FIG. **4** is an enlarged view of key parts showing upper half vertical position regulating parts of the embodiment of the present disclosure.

FIG. **5** is a flow chart of a compressor assembling method of the embodiment of the present disclosure.

FIG. **6** is an enlarged view of key parts showing a final assembling process of the embodiment of the present disclosure.

DETAILED DESCRIPTION

Hereinafter, an embodiment of the present disclosure will be described with reference to FIGS. **1** to **5**.

As shown in FIG. **1**, a rotary machine of the present embodiment is a single axis multistage type centrifugal compressor (a multistage centrifugal compressor) **1** having a plurality of impellers **22**. As shown in FIGS. **1** and **2**, the centrifugal compressor **1** of the present embodiment includes a rotor **2**, diaphragms **3**, a casing **4**, and upper half vertical position regulating parts (upper half position regulating parts) **5**.

The rotor **2** is rotatable about an axis Ar. The rotor **2** has a rotor shaft **21** that extends along the axis Ar in an axial direction Da, and a plurality of impellers **22** that rotate along with the rotor shaft **21**.

Hereinafter, a direction in which the axis Ar extends is defined as an axial direction Da. A radial direction based on the axis Ar is simply defined as a radial direction Dr. An upward direction of the surface of the page of FIG. **2** within the radial direction Dr perpendicular to the axis Ar is defined as a vertical direction Dv. A leftward/rightward direction of FIG. **2** which is the radial direction Dr and the axial direction perpendicular to the axis Ar is defined as a horizontal direction Dh. A direction around the rotor **2** that centers on the axis Ar is defined as a circumferential direction Dc.

As shown in FIG. **1**, the impellers **22** are fixed to an outer circumferential surface of the rotor shaft **21**. The impellers **22** are rotated along with the rotor shaft **21**, and thereby compress a process gas (a working fluid) using a centrifugal force. The impellers **22** are installed on the rotor shaft **21** in multiple stages in the axial direction Da. Each of the impellers **22** is a so-called close type impeller that includes a disc, a blade, and a cover.

The diaphragms **3** are disposed on an outer circumferential side of the rotor **2**. Each of the diaphragms **3** has an annular shape centering on the axis Ar. The annular diaphragms **3** have upper half diaphragms **31** and lower half diaphragms **32** (see FIG. **2**) in the vertical direction Dv on the basis of the axis Ar of the rotor **2**. The upper half diaphragms **31** and the lower half diaphragms **32** will be described in detail below.

The casing **4** is disposed on outer circumferential sides of the diaphragms **3**. The casing **4** has a tubular shape centering on the axis Ar. The tubular casing **4** has an upper half casing **41** and a lower half casing **42** (see FIG. **2**) on the basis of the axis Ar of the rotor **2**.

In the present embodiment, as shown in FIG. **2**, the upper half casing **41** and the upper half diaphragms **31** are combined to form an upper half assembly **11**. The lower half casing **42** and the lower half diaphragms **32** are combined to form a lower half assembly **12**. The upper half assembly **11** is placed on the lower half assembly **12** to interpose the rotor **2** therebetween, and thereby the centrifugal compressor **1** is formed.

The upper half casing **41** extends in the circumferential direction Dc. Flanges that extend in the horizontal direction Dh are formed on opposite ends of the upper half casing **41** of the present embodiment in the circumferential direction Dc. The upper half casing **41** has upper half casing parting planes **41**X on the opposite ends thereof in the circumferential direction Dc. The upper half casing parting planes **41**X are parting planes of one side when the casing **4** is parted up and down in the vertical direction Dv. The upper half casing parting planes **41**X are planes spread in the radial direction Dr and the axial direction Da. That is, the upper half casing parting planes **41**X are horizontal planes directed downward in the vertical direction Dv. The upper half casing **41** of the present embodiment has an upper half casing body **410** and upper half casing recesses **411**.

A cross section of the upper half casing body **410** which is perpendicular to the axis Ar has a semi-annular shape centering on the axis Ar. The upper half casing body **410** opens downward in the vertical direction Dv for the rotor **2** and the diaphragms **3** to be fitted thereinto. As shown in FIG. **1**, a plurality of upper half positioning recesses **410***a*, each of which is recessed from an inner circumferential surface throughout the circumference, are formed in the upper half casing body **410**. The upper half positioning recesses **410***a* are formed at central positions of the upper half casing body **410** in the axial direction Da.

As shown in FIG. **2**, the upper half casing recesses **411** are symmetrically formed on the two upper half casing parting planes **41**X separated in the horizontal direction Dh. Here, the upper half casing recess **411** on one side that is the right side of the surface of the page in FIG. **2** and is in the

horizontal direction Dh will be described by way of example. The upper half casing recess **411**, a description of which will be omitted, on the other side in the horizontal direction Dh also has the same shape.

As shown in FIG. **3**, the upper half casing recess **411** is recessed from the upper half casing parting plane **41**X. The upper half casing recess **411** is recessed upward on an inner circumferential side of the upper half casing parting plane **41**X in the vertical direction Dv. The upper half casing recess **411** is formed in a corner formed by an inner circumferential surface in which the upper half positioning recesses **410***a* are formed and by the upper half casing parting plane **41**X. As shown in FIGS. **1** and **4**, the upper half casing recess **411** is recessed from the inner circumferential surface of the upper half casing body **410** to have an arc shape when viewed from the upper half casing parting plane **41**X. As shown in FIG. **3**, the upper half casing recess **411** has a first upper half casing flat surface (an upper half casing recessed surface) **411***a* directed in a direction including the vertical direction Dv, and a first upper half casing curved surface **411***b* that is directed inward in the radial direction Dr.

The first upper half casing flat surface **411***a* is a surface that is spread in the radial direction Dr and the axial direction Da toward the upper half casing parting plane **41**X and directed in the direction including the vertical direction Dv. The first upper half casing flat surface **411***a* of the present embodiment is a horizontal surface that is directed downward in the vertical direction Dv. Therefore, the first upper half casing flat surface **411***a* is formed in parallel to the upper half casing parting plane **41**X. A bolt hole **411***c* is formed in the first upper half casing flat surface **411***a*.

The first upper half casing flat surface **411***a* need only be a surface directed in the direction including the vertical direction Dv, and may be a flat surface directed in a direction that is inclined with respect to the vertical direction Dv.

The first upper half casing curved surface **411***b* connects the upper half casing parting plane **41**X and the first upper half casing flat surface **411***a*. The first upper half casing curved surface **411***b* is spread in a direction perpendicular to the upper half casing parting plane **41**X and the first upper half casing flat surface **411***a*. The first upper half casing curved surface **411***b* is a concave surface that is directed inward in the radial direction Dr in a cross section perpendicular to the axis Ar. The first upper half casing curved surface **411***b* extends from the upper half casing parting plane **41**X in the vertical direction Dv.

As shown in FIG. **2**, the lower half casing **42** extends in the circumferential direction Dc. Flanges that extend in the horizontal direction Dh are formed on opposite ends of the lower half casing **42** of the present embodiment in the circumferential direction Dc. The lower half casing **42** has lower half casing parting planes **42**X on the opposite ends thereof in the circumferential direction Dc. The lower half casing parting planes **42**X are parting planes of the other side when the casing **4** is parted up and down in the vertical direction Dv. The lower half casing parting planes **42**X are planes spread in the radial direction Dr and the axial direction Da. That is, the lower half casing parting planes **42**X are horizontal planes directed upward in the vertical direction Dv. The lower half casing **42** of the present embodiment has a lower half casing body **420**.

A cross section of the lower half casing body **420** which is perpendicular to the axis Ar has a semi-annular shape centering on the axis Ar. An inner diameter of the lower half casing body **420** is formed in the same size as the upper half casing body **410**. The lower half casing body **420** opens upward in the vertical direction Dv for the rotor **2** and the diaphragms **3** to be fitted thereinto. A plurality of lower half positioning recesses (not shown), each of which is recessed from an inner circumferential surface throughout the circumference, are formed in the lower half casing body **420** to correspond to the upper half positioning recesses **410***a*. The lower half positioning recesses are formed at central positions of the lower half casing body **420** in the axial direction Da in the same shape as the upper half positioning recesses **410***a*.

The upper half diaphragms **31** extend in the circumferential direction Dc. The upper half diaphragms **31** are configured to be disposed on an inner circumferential side of the upper half casing **41**. Each of the upper half diaphragms **31** has upper half diaphragm parting planes **31**X on the opposite ends thereof in the circumferential direction Dc. The upper half diaphragm parting planes **31**X are parting planes of one side when each of the diaphragms **3** is parted up and down in the vertical direction Dv. The upper half diaphragm parting planes **31**X are planes spread in the radial direction Dr and the axial direction Da. That is, the upper half diaphragm parting planes **31**X are horizontal planes directed downward in the vertical direction Dv. The upper half diaphragm **31** of the present embodiment has an upper half diaphragm body **310** and upper half diaphragm recesses **311**.

A cross section of the upper half diaphragm body **310** which is perpendicular to the axis Ar has a semi-annular shape centering on the axis Ar. The upper half diaphragm body **310** is configured to be housed in the opening portion of the upper half casing body **410** in a state in which a slight gap is provided on the inner circumferential surface side of the upper half casing body **410**. The upper half diaphragm body **310** opens downward in the vertical direction Dv for the rotor **2** to be fitted thereinto. An outer diameter of the upper half diaphragm body **310** is formed to be slightly smaller than an inner diameter of the upper half casing body **410**. The upper half diaphragm body **310** has a semi-elliptical shape in which a diameter thereof in the vertical direction Dv is slightly (e.g., about 1 mm) longer than that in the horizontal direction Dh. As shown in FIGS. **1** and **4**, upper half spigot parts **310***a* that protrude from an outer circumferential surface throughout the circumference are formed in the upper half diaphragm bodies **310**. Each of the upper half spigot parts **310***a* is formed at a central position of the upper half diaphragm body **310** in the axial direction Da. The upper half spigot parts **310***a* are fitted into the upper half positioning recesses **410***a*, and thereby a position of the upper half diaphragm **31** in the axial direction Da relative to the upper half casing **41** is defined.

As shown in FIG. **2**, the upper half diaphragm recesses **311** are symmetrically formed on the two upper half diaphragm parting planes **31**X separated in the horizontal direction Dh. Here, the upper half diaphragm recess **311** on one side that is the right side of the surface of the page in FIG. **2** and is in the horizontal direction Dh will be described by way of example. The upper half diaphragm recess **311**, a description of which will be omitted, on the other side in the horizontal direction Dh also has the same shape.

As shown in FIG. **3**, the upper half diaphragm recess **311** is recessed from the upper half diaphragm parting plane **31**X. The upper half diaphragm recess **311** is recessed upward on an inner circumferential side of the upper half diaphragm parting plane **31**X in the vertical direction Dv. The upper half diaphragm recess **311** is formed in a corner formed by an outer circumferential surface on which the upper half spigot parts **310***a* of the upper half diaphragm

body **310** are formed and by the upper half diaphragm parting plane **31**X. When the upper half diaphragm **31** is disposed on the inner circumferential side of the upper half casing **41**, the upper half diaphragm recess **311** forms a housing space S that communicates with the upper half casing recess **411**. Therefore, in the state in which the upper half diaphragm **31** is disposed on the inner circumferential side of the upper half casing **41**, the upper half diaphragm recess **311** of the present embodiment is formed such that a position thereof in the circumferential direction Dc and the axial direction Da becomes the same position as the upper half casing recess **411**. As shown in FIG. **4**, the upper half diaphragm recess **311** is recessed from the upper half diaphragm body **310** to have an arc shape when viewed from the upper half diaphragm parting plane **31**X side. Thereby, the upper half diaphragm recess **311** has a circular shape along with the upper half casing recess **411** when viewed from the upper half diaphragm parting plane **31**X side. As shown in FIG. **3**, a depth of the upper half diaphragm recess **311** of the present embodiment from the upper half diaphragm parting plane **31**X is made deeper than that of the upper half casing recess **411** from the upper half casing parting plane **41**X. The upper half diaphragm recess **311** has a first upper half diaphragm flat surface (upper half diaphragm recessed surface) **311***a* directed in the direction including the vertical direction Dv, and a first upper half diaphragm curved surface **311***b* that is directed outward in the radial direction Dr.

The first upper half diaphragm flat surface **311***a* is a surface that is spread in the radial direction Dr and the axial direction Da toward the upper half diaphragm parting plane **31**X and directed in the direction including the vertical direction Dv. The first upper half diaphragm flat surface **311***a* of the present embodiment is a horizontal surface that is directed downward in the vertical direction Dv. Therefore, the first upper half diaphragm flat surface **311***a* is formed in parallel to the upper half diaphragm parting plane **31**X. In a state in which the upper half diaphragm **31** is disposed on the inner circumferential side of the upper half casing **41** and the upper half diaphragm parting plane **31**X and the upper half casing parting plane **41**X are disposed on the same surface, the first upper half diaphragm flat surface **311***a* is formed to be located farther from the upper half diaphragm parting plane **31**X than the first upper half casing flat surface **411***a*. That is, when the upper half assembly **11** is combined with the lower half assembly **12**, the first upper half diaphragm flat surface **311***a* is located above the first upper half casing flat surface **411***a* in the vertical direction Dv.

The first upper half diaphragm flat surface **311***a* need only be a surface directed in the direction including the vertical direction Dv, and may be a flat surface directed in the direction that is inclined with respect to the vertical direction Dv.

The first upper half diaphragm curved surface **311***b* connects the upper half diaphragm parting plane **31**X and the first upper half diaphragm flat surface **311***a*. The first upper half diaphragm curved surface **311***b* is spread in a direction perpendicular to the upper half diaphragm parting plane **31**X and the first upper half diaphragm flat surface **311***a*. The first upper half diaphragm curved surface **311***b* is a concave surface that is directed outward in the radial direction Dr in the cross section perpendicular to the axis Ar. The first upper half diaphragm curved surface **311***b* extends from the upper half diaphragm parting planes **31**X in the vertical direction Dv. The length of the first upper half diaphragm curved surface **311***b* in the vertical direction Dv is longer than that of the first upper half casing curved surface **411***b* in the vertical direction Dv.

As shown in FIG. **2**, the lower half diaphragm **32** extends in the circumferential direction Dc. The lower half diaphragm **32** is configured to be disposed on the inner circumferential side of the lower half casing **42**. The lower half diaphragm **32** has lower half diaphragm parting planes **32**X on the opposite ends thereof in the circumferential direction Dc. The lower half diaphragm parting planes **32**X are parting planes of the other side when the diaphragm **3** is parted up and down in the vertical direction Dv. The lower half diaphragm parting planes **32**X are planes spread in the radial direction Dr and the axial direction Da. That is, the lower half diaphragm parting planes **32**X are horizontal planes directed upward in the vertical direction Dv. The lower half diaphragm **32** of the present embodiment has a lower half diaphragm body **320**.

A cross section of the lower half diaphragm body **320** which is perpendicular to the axis Ar has a semi-annular shape centering on the axis Ar. The lower half diaphragm body **320** is configured to be housed in the opening portion of the lower half casing body **420** in a state in which a slight gap is provided on the inner circumferential surface side of the lower half casing body **420**. The lower half diaphragm body **320** opens upward in the vertical direction Dv for the rotor **2** to be fitted thereinto. An outer diameter of the lower half diaphragm body **320** is formed to be slightly smaller than an inner diameter of the lower half casing body **420**. The outer diameter of the lower half diaphragm body **320** is formed in the same size as the upper half diaphragm body **310**. The lower half diaphragm body **320** has a semi-elliptical shape in which a diameter thereof in the vertical direction Dv is slightly (e.g., about 1 mm) longer than that in the horizontal direction Dh. A plurality of lower half spigot parts (not shown) that protrude from an outer circumferential surface throughout the circumference are formed in the lower half diaphragm bodies **320** to correspond to the upper half spigot parts **310***a*. Each of the lower half spigot parts is formed at a central position of the lower half diaphragm body **320** in the axial direction Da in the same shape as the upper half spigot parts **310***a*. The lower half spigot parts are fitted into the lower half positioning recesses, and thereby a position of the lower half diaphragm **32** in the axial direction Da relative to the lower half casing **42** is defined.

The upper half vertical position regulating parts **5** are provided in two places separated in the horizontal direction Dh. Here, the upper half vertical position regulating part **5** provided on one side that is the right side of the surface of the page in FIG. **2** and is in the horizontal direction Dh will be described by way of example. The upper half vertical position regulating part **5**, a description of which will be omitted, on the other side in the horizontal direction Dh also has the same configuration.

As shown in FIG. **3**, the upper half vertical position regulating part **5** regulates positions of the upper half casing **41** and the upper half diaphragm **31** in a state in which the upper half diaphragm parting plane **31**X can move relative to the upper half casing parting plane **41**X to protrude in the vertical direction Dv. The upper half vertical position regulating part **5** regulates relative movement between the upper half casing **41** and the upper half diaphragm **31** in a direction perpendicular to the upper half casing parting plane **41**X and the upper half diaphragm parting plane **31**X. That is, the upper half vertical position regulating part **5** regulates relative movement between the upper half casing **41** and the

upper half diaphragm **31** in the vertical direction Dv. The upper half vertical position regulating part **5** of the present embodiment regulates a position of the upper half diaphragm **31** in the vertical direction Dv relative to the upper half casing **41**. Thereby, the upper half vertical position regulating part **5** allows the upper half casing **41** and the upper half diaphragm **31** to perform the relative movement between a position at which the upper half diaphragm parting plane **31**X protrudes in the vertical direction Dv relative to the upper half casing parting planes **41**X and a position at which the upper half diaphragm parting plane **31**X does not protrude (a position at which the upper half casing parting plane **41**X protrudes in the vertical direction Dv relative to the upper half diaphragm parting plane **31**X). The upper half vertical position regulating part **5** is provided in the housing space S. The upper half vertical position regulating part **5** has an upper half abutting member **51**.

The upper half abutting member **51** is fixed to at least one of the upper half casing **41** and the upper half diaphragm **31** in the housing space S. The upper half abutting member **51** of the present embodiment is mounted on the upper half casing **41**. The upper half abutting member **51** restricts an amount of relative movement of the first upper half diaphragm flat surface **311***a* relative to the first upper half casing flat surface **411***a* in the vertical direction Dv. The upper half abutting member **51** of the present embodiment prevents the first upper half diaphragm flat surface **311***a* from protruding further toward the upper half casing parting plane **41**X than the first upper half casing flat surface **411***a*. The upper half abutting member **51** of the present embodiment is a bolt member. The upper half abutting member **51** has a head part **51**A and a threaded part **51**B.

The head part **51**A is formed in such a size that it can be housed in the housing space S. The head part **51**A has an upper half abutting surface **511** that faces the first upper half casing flat surface **411***a* and the first upper half diaphragm flat surface **311***a*, an upper half separating surface **512** that faces the opposite side at a position away from the upper half abutting surface **511**, and an upper half connecting lateral surface **513** that connects the upper half abutting surface **511** and the upper half separating surface **512**.

The upper half abutting surface **511** is configured to be coming into contact with the first upper half casing flat surface **411***a* and the first upper half diaphragm flat surface **311***a*. The upper half abutting surface **511** of the present embodiment is a seating face of the head part **51**A of the bolt member. The upper half abutting surface **511** is a flat surface that is parallel to the first upper half casing flat surface **411***a* and the first upper half diaphragm flat surface **311***a*. The upper half abutting surface **511** has an annular shape.

The upper half separating surface **512** is a flat surface that is parallel to the upper half abutting surface **511**. The upper half separating surface **512** of the present embodiment is a top face of the head part **51**A of the bolt member. In the state in which the head part **51**A is disposed in the housing space S, the upper half separating surface **512** is formed closer to the first upper half diaphragm flat surface **311***a* and the first upper half casing flat surface **411***a* than the upper half diaphragm parting plane **31**X and the upper half casing parting plane **41**X.

The upper half connecting lateral surface **513** is a lateral surface perpendicular to the upper half abutting surface **511** and the upper half separating surface **512**. In the state in which the head part **51**A is disposed in the housing space S, the upper half connecting lateral surface **513** is formed at a position at which a slight gap is formed between the first upper half diaphragm curved surface **311***b* and the first upper half casing curved surface **411***b*.

The threaded part **51**B fixes the head part **51**A to the upper half casing **41**. The threaded part **51**B is fixed in a state in which it is inserted into the bolt hole **411***c* formed in the first upper half casing flat surface **411***a*.

The upper half abutting member **51** is fixed to the upper half casing **41** such that the head part **51**A does not stick out of the housing space S in a state in which the upper half diaphragm **31** is housed in the upper half casing **41** in a state in which the upper half diaphragm parting plane **31**X and the upper half casing parting plane **41**X directed upward in the vertical direction Dv. In this case, the upper half abutting surface **511** comes into contact with the first upper half casing flat surface **411***a* alone, and is disposed at a position at which a gap is formed from the first upper half diaphragm flat surface **311***a*. The upper half separating surface **512** is disposed at a position at which it does not stick out of the upper half diaphragm parting plane **31**X and the upper half casing parting plane **41**X.

Next, a compressor assembling method S**1** for assembling the centrifugal compressor **1** will be described. In the present embodiment, the compressor assembling method S**1** by which components are formed from the beginning, and are assembled to manufacture the centrifugal compressor **1** will be described. The compressor assembling method S**1** is not limited to the case in which the centrifugal compressor **1** is manufactured from the beginning, and may be used when the centrifugal compressor **1** is disassembled and assembled again when repair or inspection is performed.

As shown in FIG. **5**, the compressor assembling method S**1** of the present embodiment includes an upper half casing preparing process S**2**, an upper half diaphragm preparing process S**3**, a lower half casing preparing process S**4**, a lower half diaphragm preparing process S**5**, an upper half assembling process S**6**, a lower half assembling process S**7**, and a final assembling process S**8**.

In the upper half casing preparing process S**2**, the upper half casing **41** is prepared. In the upper half casing preparing process S**2** of the present embodiment, the upper half casing **41** is formed, thereby being prepared. The upper half casing preparing process S**2** has an upper half casing body forming process S**21** and an upper half casing recess forming process S**22**.

In the upper half casing body forming process S**21**, the upper half casing body **410** is formed.

In the upper half casing recess forming process S**22**, the upper half casing recesses **411** are formed. The upper half casing recess forming process S**22** is performed after the upper half casing body forming process S**21**. In the upper half casing recess forming process S**22**, the first upper half casing flat surfaces **411***a* are formed in parallel to the upper half casing parting planes **41**X.

In the upper half diaphragm preparing process S**3**, the upper half diaphragms **31** are prepared. In the upper half diaphragm preparing process S**3** of the present embodiment, the upper half diaphragms **31** are formed, thereby being prepared. The upper half diaphragm preparing process S**3** has an upper half diaphragm body forming process S**31** and an upper half diaphragm recess forming process S**32**.

In the upper half diaphragm body forming process S**31**, the upper half diaphragm body **310** is formed.

The upper half diaphragm recess forming process S**32** is performed after the upper half diaphragm body forming process S**31**. In the upper half diaphragm recess forming process S**32**, the upper half diaphragm recesses **311** are formed. In the upper half diaphragm recess forming process

S32, the first upper half diaphragm flat surfaces **311***a* are formed in parallel to the upper half diaphragm parting planes **31**X.

In the lower half casing preparing process S**4**, the lower half casing **42** is prepared. In the lower half casing preparing process S**4** of the present embodiment, the lower half casing **42** is formed, thereby being prepared. In the lower half casing preparing process S**4** of the present embodiment, the lower half casing body **420** is formed.

In the lower half diaphragm preparing process S**5**, the lower half diaphragms **32** are prepared. In the lower half diaphragm preparing process S**5**, the lower half diaphragms **32** are formed, thereby being prepared. In the lower half diaphragm preparing process S**5** of the present embodiment, the lower half diaphragm body **320** is formed.

The upper half casing preparing process S**2**, the upper half diaphragm preparing process S**3**, the lower half casing preparing process S**4**, and the lower half diaphragm preparing process S**5** may be performed from any one of them, and the order of performing them may also be arbitrary. Therefore, these processes may be performed in parallel. In the upper half casing preparing process S**2**, the upper half diaphragm preparing process S**3**, the lower half casing preparing process S**4**, and the lower half diaphragm preparing process S**5**, each member may only be previously prepared without being formed.

The upper half assembling process S**6** is performed after the upper half casing preparing process S**2** and the upper half diaphragm preparing process S**3**. In the upper half assembling process S**6**, the upper half diaphragms **31** are disposed on the inner circumferential side of the upper half casing **41**, and the upper half assembly **11** is formed. After the upper half diaphragms **31** are disposed on the inner circumferential side of the upper half casing **41**, the upper half vertical position regulating parts **5** are mounted on at least one of the upper half casing **41** and the upper half diaphragm **31**. Thereby, in the upper half assembling process S**6**, the upper half assembly **11** in which positions of the vertical direction Dv and the horizontal direction Dh are regulated such that the central positions of the upper half casing **41** and the upper half diaphragm **31** are aligned in a state in which a predetermined gap is provide between the inner circumferential surface of the upper half casing **41** and the outer circumferential surface of the upper half diaphragm **31** is formed. To be specific, the upper half assembling process S**6** of the present embodiment has an upper half casing disposing process S**61**, an upper half diaphragm disposing process S**62**, and an upper half vertical position regulating process S**63**.

In the upper half casing disposing process S**61**, in a state in which the upper half casing parting planes **41**X are directed upward in the vertical direction Dv, the upper half casing **41** is disposed.

In the upper half diaphragm disposing process S**62**, in a state in which the upper half diaphragm parting planes **31**X are directed upward in the vertical direction Dv, the upper half diaphragms **31** are disposed on the inner circumferential side of the upper half casing **41**. In the upper half diaphragm disposing process S**62** of the present embodiment, in a state in which the upper half spigot parts **310***a* are fitted into the upper half positioning recesses **410***a*, the upper half diaphragms **31** are housed on the inner circumferential side of the upper half casing **41** from above in the vertical direction Dv. In the upper half diaphragm disposing process S**62**, the upper half diaphragms **31** are disposed to align positions of the upper half casing recesses **411** and the upper half diaphragm recesses **311** to form the housing spaces S. Thereby, positions of the upper half diaphragms **31** in the axial direction Da relative to the upper half casing **41** and positions of the upper half diaphragms **31** in the horizontal direction Dh are regulated.

In the upper half vertical position regulating process S**63**, positions of the upper half diaphragms **31** in the vertical direction Dv relative to the upper half casing **41** are regulated. The upper half vertical position regulating process S**63** is performed after the upper half diaphragm disposing process S**62**. In the upper half vertical position regulating process S**63**, the upper half abutting member **51** is provided in the housing space S as the upper half vertical position regulating part **5**. In the upper half vertical position regulating process S**63**, in a state in which at least one of the first upper half casing flat surface **411***a* and the first upper half diaphragm flat surface **311***a* comes into contact with the upper half abutting surface **511**, and in a state in which the upper half abutting surface **511** can move in the vertical direction Dv relative to the other of the first upper half casing flat surface **411***a* and the first upper half diaphragm flat surface **311***a*, the upper half abutting member **51** is fixed. In the upper half vertical position regulating process S**63** of the present embodiment, in a state in which the upper half abutting surface **511** makes a gap with respect to the first upper half diaphragm flat surface **311***a* while coming into contact with the first upper half casing flat surface **411***a*, the upper half abutting member **51** is fixed to the upper half casing **41**. To be specific, in a state in which the threaded part **51**B is inserted into the bolt hole formed in the first upper half casing flat surface **411***a* up to a position at which the seating face abuts the first upper half casing flat surface **411***a*, the upper half abutting member **51** is fixed to the upper half casing **41**.

The lower half assembling process S**7** is performed after the lower half casing preparing process S**4** and the lower half diaphragm preparing process S**5**. In the lower half assembling process S**7**, the lower half diaphragms **32** are disposed on the inner circumferential side of the lower half casing **42**, and the lower half assembly **12** is formed. The lower half assembling process S**7** of the present embodiment has a lower half casing disposing process S**71** and a lower half diaphragm disposing process S**72**.

In the lower half casing disposing process S**71**, in a state in which the lower half casing parting planes **42**X are directed upward in the vertical direction Dv, the lower half casing **42** is disposed.

In the lower half diaphragm disposing process S**72**, in a state in which the lower half diaphragm parting planes **32**X are directed upward in the vertical direction Dv, the lower half diaphragms **32** are disposed on the inner circumferential side of the lower half casing **42**. In the lower half diaphragm disposing process S**72** of the present embodiment, in a state in which the lower half spigot parts are fitted into the lower half positioning recesses, the lower half diaphragms **32** are housed on the inner circumferential side of the upper half casing **41** from above in the vertical direction Dv.

In the final assembling process S**8**, the upper half diaphragm parting planes **31**X are brought into contact with the lower half diaphragm parting planes **32**X, and the upper half assembly **11** is installed on the lower half assembly **12**. To be specific, in the final assembling process S**8**, the rotor **2** is disposed on the lower half assembly **12**. In a state in which the rotor **2** is disposed, the upper half assembly **11** in which the upper half diaphragm parting planes **31**X is kept movable relative to the upper half casing parting planes **41**X to protrude in the vertical direction Dv is placed on the lower half assembly **12**. As shown in FIG. **6**, when the upper half

assembly **11** is moved relative to the lower half assembly **12** from above in the vertical direction Dv, the lower half diaphragm parting planes **32**X and the upper half diaphragm parting planes **31**X come into contact with each other before the lower half casing parting planes **42**X and the upper half casing parting planes **41**X come into contact with each other. Afterward, the upper half assembly **11** is further moved downward relative to the lower half assembly **12** in the vertical direction Dv, and thereby the upper half diaphragm parting planes **31**X are pressed against the lower half diaphragm parting planes **32**X. Thereby, the upper half diaphragms **31** are moved upward relative to the upper half casing **41** in the vertical direction Dv. As a result, in the state in which the lower half diaphragm parting planes **32**X and the upper half diaphragm parting planes **31**X are in contact with each other, the lower half casing parting planes **42**X and the upper half casing parting planes **41**X come into contact with each other. Therefore, in a state in which the upper half casing parting planes **41**X come into contact with the lower half casing parting planes **42**X, and the upper half diaphragm parting planes **31**X also come into contact with the lower half diaphragm parting planes **32**X, a compressor is formed.

According to the centrifugal compressor **1**, the upper half assembly **11** of the compressor, the upper half diaphragms **31** of the compressor, and the compressor assembling method S**1**, to combine the upper half assembly **11** and the lower half assembly **12**, the upper half diaphragm parting planes **31**X and the upper half casing parting planes **41**X are directed downward in the vertical direction Dv. The upper half diaphragms **31** are configured to be movable relative to the upper half casing **41**. Thereby, the upper half diaphragms **31** are lowered due to deadweight, and the upper half diaphragm parting planes **31**X protrude downward from the upper half casing parting planes **41**X in the vertical direction Dv. For this reason, when the upper half assembly **11** is placed on the lower half assembly **12**, the lower half diaphragm parting planes **32**X and the upper half diaphragm parting planes **31**X can be brought into contact with each other before the lower half casing parting planes **42**X and the upper half casing parting planes **41**X come into contact with each other. As a result, in a state in which the upper half diaphragm parting planes **31**X and the lower half diaphragm parting planes **32**X are reliably in contact with each other, the upper half casing parting planes **41**X and the lower half casing parting planes **42**X come into contact with each other, and the upper half assembly **11** and the lower half assembly **12** are combined. Therefore, only by placing the upper half assembly **11** on the lower half assembly **12**, the lower half diaphragm parting planes **32**X and the upper half diaphragm parting planes **31**X as well as the lower half casing parting planes **42**X and the upper half casing parting planes **41**X can come into contact with each other with high accuracy. Thereby, the occurrence of the gap between the parting planes of the diaphragm **3** is suppressed while reducing adjustment work for positioning, and the upper half assembly **11** and the lower half assembly **12** can be assembled.

In the state in which the first upper half casing flat surface **411***a* and the upper half abutting surface **511** are in contact with each other, and in the state in which the upper half abutting surface **511** makes a gap with respect to the first upper half diaphragm flat surface **311***a*, the upper half abutting member **51** is fixed. For this reason, the first upper half casing flat surface **411***a* is made immovable relative to the upper half abutting surface **511**, and the first upper half diaphragm flat surface **311***a* is made movable relative to the upper half abutting surface **511**. Thereby, by means of the upper half abutting member **51**, the upper half diaphragm parting planes **31**X is kept movable relative to the upper half casing parting planes **41**X to protrude in the vertical direction Dv. That is, only by mounting the upper half abutting member **51** on the upper half casing **41**, the upper half diaphragms **31** can be made movable relative to the upper half casing **41** in a state in which the upper half casing **41** and the upper half diaphragms **31** are put together. Therefore, the adjustment work for positioning can be performed only by fixing the upper half abutting member **51**, thereby the work load can be reduced.

Since the upper half abutting member **51** is the bolt member, an amount of relative movement of the first upper half diaphragm flat surface **311***a* relative to first upper half casing flat surface **411***a* can be restricted using the seating face of the head part **51**A of the bolt member. Thereby, the relative movement of the upper half diaphragm parting planes **31**X relative to the upper half casing parting planes **41**X in the vertical direction Dv can be restricted by a simple configuration.

Furthermore, when the upper half abutting member **51** is mounted, the threaded part **51**B is inserted into the bolt hole formed in the first upper half casing flat surface **411***a* up to a position at which the seating face abuts the first upper half casing flat surface **411***a*. For this reason, there is no need to finely adjust a position of the upper half abutting surface **511** for the first upper half casing flat surface **411***a*. For this reason, the upper half abutting member **51** can be easily mounted on the upper half casing **41**.

The head part **51**A of the upper half abutting member **51** that is the bolt member is disposed in the housing space S. For this reason, the upper half abutting member **51** is disposed not to protrude from the upper half casing parting plane **41**X and the upper half diaphragm parting plane **31**X. Therefore, when the upper half assembly **11** and the lower half assembly **12** are combined, it is possible to prevent the upper half abutting member **51** from being disposed at an interfering position between the lower half diaphragm parting plane **32**X and the upper half diaphragm parting plane **31**X or between the lower half diaphragm parting plane **32**X and the upper half diaphragm parting plane **31**X. For this reason, when the upper half assembly **11** and the lower half assembly **12** are combined, it is possible to prevent the upper half abutting member **51** from being obstacles.

The upper half diaphragm recesses **311** are formed to be deeper than the upper half casing recesses **411**. In addition, an amount of relative movement of the upper half diaphragm parting plane **31**X relative to the upper half casing parting plane **41**X in the vertical direction Dv can be adjusted only by changing the depth of the upper half diaphragm recess **311**.

Especially, the first upper half casing flat surface **411***a* and the upper half casing parting plane **41**X are formed in parallel, and the first upper half diaphragm flat surface **311***a* and the upper half diaphragm parting plane **31**X are formed in parallel. For this reason, only by adjusting positions of the parallel surfaces of the first upper half casing flat surface **411***a* and the upper half casing parting plane **41**X in the vertical direction Dv and positions of the parallel surfaces of the first upper half diaphragm flat surface **311***a* and the upper half diaphragm parting plane **31**X in the vertical direction Dv, positions of the upper half casing parting plane **41**X and the upper half diaphragm parting plane **31**X when the upper half abutting member **51** is mounted are adjusted. Thereby, the amount of protrusion of the upper half diaphragm parting plane **31**X relative to the upper half casing parting plane **41**X can be delicately adjusted with ease.

In the upper half vertical position regulating process S**63**, in the state in which the upper half casing parting planes **41**X and the upper half diaphragm parting planes **31**X are directed upward in the vertical direction Dv, the upper half abutting members **51** are mounted in the upper half casing **41**. For this reason, a worker can mount the upper half abutting members **51** in the upper half casing **41** and the upper half diaphragms **31** from above in the vertical direction Dv. Therefore, when the upper half abutting members **51** are fixed to the upper half casing **41**, there is no need to do work to sneak into the upper half diaphragms **31** and the upper half casing **41** from below in the vertical direction Dv. As a result, the upper half abutting members **51** can be easily mounted in the upper half casing **41** and the upper half diaphragms **31**.

Another Modified Examples of the Embodiment

The upper half vertical position regulating part **5** is not limited to being provided on the upper half spigot part **310***a*. The upper half vertical position regulating part **5** may be provided in accordance with a position of a fixture such as a bolt that fixes the upper half casing **41** and the lower half casing **42**. Therefore, when the upper half vertical position regulating part **5** is provided at a position away from the upper half spigot part **310***a*, the upper half diaphragm recess **311** or the upper half casing recess **411** may be formed at a position away, in the axial direction Da, from the position at which the upper half spigot part **310***a* is formed.

The upper half vertical position regulating part **5** is not limited to having only the upper half abutting member **51** that is the bolt member, and may have a plurality of members including a frame in which the upper half abutting surface **511** is formed.

While preferred embodiments of the disclosure have been described and shown above, it should be understood that these are exemplary of the disclosure and are not to be considered as limiting. Additions, omissions, substitutions, and other modifications can be made without departing from the spirit or scope of the present disclosure. Accordingly, the disclosure is not to be considered as being limited by the foregoing description, and is only limited by the scope of the appended claims.

What is claimed is:

1. A compressor comprising:

an upper half casing extending in a circumferential direction of a rotor that is rotatable about an axis and having upper half casing parting planes that are horizontal planes facing downward in a vertical direction at opposite ends thereof in the circumferential direction;

a lower half casing extending in the circumferential direction and having lower half casing parting planes that come into contact with the upper half casing parting planes at opposite ends thereof in the circumferential direction;

upper half diaphragms extending in the circumferential direction, configured to be disposed on an inner circumferential side of the upper half casing, and having upper half diaphragm parting planes that are horizontal planes facing downward in the vertical direction at opposite ends thereof in the circumferential direction;

lower half diaphragms extending in the circumferential direction, configured to be disposed on an inner circumferential side of the lower half casing, and having lower half diaphragm parting planes that come into contact with the upper half diaphragm parting planes at opposite ends thereof in the circumferential direction; and

upper half position regulating parts configured to regulate positions of the upper half casing and the upper half diaphragms in a state in which the upper half diaphragm parting planes are movable relative to the upper half casing parting planes to protrude in the vertical direction,

wherein the upper half casing has upper half casing recesses that are recessed upward on inner circumferential sides of the upper half casing parting planes in the vertical direction such that upper half casing recessed surfaces directed in a direction including the vertical direction are formed,

wherein each of the upper half diaphragms has upper half diaphragm recesses that are recessed upward on outer circumferential sides of the upper half diaphragm parting planes in the vertical direction such that upper half diaphragm recessed surfaces directed in the direction including the vertical direction are formed, and that form housing spaces communicating with the upper half casing recesses when disposed on the inner circumferential side of the upper half casing,

wherein the upper half position regulating parts are fixed to at least one of the upper half casing and one of the upper half diaphragms in the housing spaces, and have upper half abutting members at which upper half abutting surfaces, each of which comes into contact with the upper half casing recessed surface and the upper half diaphragm recessed surface, are formed,

wherein the upper half abutting members are fixed to the upper half casing in a state in which each of the upper half abutting surfaces is in contact only with the upper half casing recessed surface and makes a gap with respect to the upper half diaphragm recessed surface,

wherein each of the upper half abutting members is a bolt member in which the upper half abutting surface becomes a seating face, and is inserted into and fixed in a bolt hole formed in the upper half casing recessed surface,

wherein the upper half diaphragm recess is recessed from the upper half diaphragm to have an arc shape when viewed from the upper half diaphragm parting plane side,

wherein a depth of the upper half diaphragm recess is deeper than that of the upper half casing recess.

2. An upper half assembly of a compressor comprising:

an upper half casing extending in a circumferential direction of a rotor that is rotatable about an axis and having upper half casing parting planes that are horizontal planes facing downward in a vertical direction at opposite ends thereof in the circumferential direction;

upper half diaphragms extending in the circumferential direction, configured to be disposed on an inner circumferential side of the upper half casing, and having upper half diaphragm parting planes that are horizontal planes facing downward in the vertical direction at opposite ends thereof in the circumferential direction; and

upper half position regulating parts configured to regulate positions of the upper half casing and the upper half diaphragms in a state in which the upper half diaphragm parting planes are movable relative to the upper half casing parting planes to protrude in the vertical direction,

wherein the upper half casing has upper half casing recesses that are recessed upward on inner circumferential sides of the upper half casing parting planes in the vertical direction such that upper half casing recessed surfaces directed in a direction including the vertical direction are formed,

wherein each of the upper half diaphragms has upper half diaphragm recesses that are recessed upward on outer circumferential sides of the upper half diaphragm parting planes in the vertical direction such that upper half diaphragm recessed surfaces directed in the direction including the vertical direction are formed, and that form housing spaces communicating with the upper half casing recesses when disposed on the inner circumferential side of the upper half casing,

wherein the upper half position regulating parts are fixed to at least one of the upper half casing and one of the upper half diaphragms in the housing spaces, and have upper half abutting parts at which upper half abutting surfaces, each of which comes into contact with the upper half casing recessed surface and the upper half diaphragm recessed surface, are formed,

wherein the upper half abutting parts are fixed to the upper half casing in a state in which each of the upper half abutting surfaces is in contact with the upper half casing recessed surface and makes a gap with respect to the upper half diaphragm recessed surface,

wherein each of the upper half abutting parts is a bolt member in which the upper half abutting surface becomes a seating face, and is inserted into and fixed in a bolt hole formed in the upper half casing recessed surface,

wherein the upper half diaphragm recess is recessed from the upper half diaphragm to have an arc shape when viewed from the upper half diaphragm parting plane side,

wherein a depth of the upper half diaphragm recess is deeper than that of the upper half casing recess.

3. A compressor assembling method comprising:

an upper half casing preparing process of preparing an upper half casing that extends in a circumferential direction of a rotor that is rotatable about an axis and has upper half casing parting planes that are horizontal planes facing downward in a vertical direction at opposite ends thereof in the circumferential direction;

a lower half casing preparing process of preparing a lower half casing that extends in the circumferential direction and has lower half casing parting planes that come into contact with the upper half casing parting planes at opposite ends thereof in the circumferential direction;

an upper half diaphragm preparing process of preparing upper half diaphragms that extend in the circumferential direction, are configured to be disposed on an inner circumferential side of the upper half casing, and have upper half diaphragm parting planes that are horizontal planes facing downward in the vertical direction at opposite ends thereof in the circumferential direction;

a lower half diaphragm preparing process of preparing lower half diaphragms that extend in the circumferential direction, are configured to be disposed on an inner circumferential side of the lower half casing, and have lower half diaphragm parting planes that come into contact with the upper half diaphragm parting planes at opposite ends thereof in the circumferential direction;

an upper half assembling process of mounting upper half position regulating parts, which keep the upper half casing and the upper half diaphragms movable relative to each other such that the upper half diaphragm parting planes protrude in the vertical direction with respect to the upper half casing parting planes after the upper half diaphragms are disposed on the inner circumferential side of the upper half casing, on at least one of the upper half casing and one of the upper half diaphragms and forming an upper half assembly;

a lower half assembling process of disposing the lower half diaphragms on the inner circumferential side of the lower half casing and forming a lower half assembly; and

a final assembling process of bringing the upper half diaphragm parting planes into contact with the lower half diaphragm parting planes and installing the upper half assembly on the lower half assembly;

wherein in the final assembling process, the upper half assembly in which the upper half diaphragm parting planes are protruded in the vertical direction relative to the upper half casing parting planes is placed on the lower half assembly, afterward, the lower half casing parting planes and the upper half casing parting planes come into contact with each other, after the lower half diaphragm parting planes and the upper half diaphragm parting planes are in contact with each other.

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